

## VALVE MECHANISM

## [0001] BACKGROUND OF THE INVENTION

## [0002] Field of the Invention

[0003] This invention relates to a valve mechanism which can be used regardless of the diameter of the nozzle of a suction device, and does not damage any other, for example, tightly closed bag stacked on its outside or placed adjacent to it, while allowing bags stacked on or adjacent to one another to form a flat and stable shape of packing.

## [0004] Description of the Related Art

[0005] As a bag for holding its contents by keeping them from the ambient air, there is known, for example, a tightly closed and compressed bag from which air is forced out by suction to reduce its volume as evacuated and the volume of its contents (if compressible). A compressed and tightly closed bag will hereinafter be referred to simply as a "tightly closed bag" unless any particular necessity to the contrary arises.

[0006] A tightly closed bag as mentioned above is sometimes equipped with a valve mechanism for keeping its inside and outside from each other so that when air has been forced out from its inside by suction, a negative pressure prevailing in its inside may not allow air to flow in from its outside (see, for example, Patent Literature 1 and Patent

Literature 2). Patent Literature 1 - JP-A-6-227551 (Claim 1 and Fig. 4), Patent Literature 2 -JP-UM-A-4-132043 (Claim 1 and Figs. 2 and 3).

[0007] According to Patent Literature 1 and 2, however, a tightly closed bag has a connector projecting from its valve mechanism mounting side for connecting the nozzle of a suction device, and it produces inconveniences as pointed out below. More specifically, the known valve mechanism has a problem in that the diameter (or shape) of the nozzle does not suit the shape of the connector projecting from the valve mechanism mounting side.

[0008] Moreover, it is likely to result from the projection of the connector from the valve mechanism mounting side of a tightly closed bag that when tightly closed bags holding their contents are stacked on one another, the load of an upper bag may be concentrated on the projecting portion of a lower bag and its stress may damage the contents of the upper bag. Furthermore, it has been likely that stacked bags may not form a flat shape of packing, but may make an inclined shape formed by the gradual elevation of their valve mechanism mounting portions, making it impossible to stack many tightly closed bags holding their contents on one another.

[0009] Moreover, it has been likely that the connector projecting from the valve mechanism mounting side of one tightly closed bag may interfere with another tightly closed bag, for example, stacked as mentioned above and damage it.

[0010] SUMMARY OF THE INVENTION

[0011] It is an object of this invention to solve the problems as pointed out above and provide a valve mechanism which can be used regardless of the diameter of the nozzle of a suction device, and does not damage any other, for example, tightly closed bag stacked on its outside or placed adjacent to it, while allowing bags stacked on or adjacent to one another to form a flat and stable shape of packing.

[0012] In order to attain the above object, the valve mechanism according to this invention has a suction connector mounted on the outer side of a tightly closed bag having a hole formed therein, the suction connector having a vent formed in its center and being so shaped as not to form any projection on the outer side of the tightly closed bag, and a valve base mounted on the inner side of the tightly closed bag and having a recessed shape in cross section. Thus, it can be used regardless of the diameter of the nozzle of a suction device, does not damage any other, for example, tightly closed bag stacked on its outside or placed adjacent to it, but allows bags stacked on, or placed adjacent to one another to form a flat and stable shape of packing.

[0013] BRIEF DESCRIPTION OF THE DRAWINGS

[0014] Fig. 1A is a top plan view of a valve mechanism according to this invention;

[0015] Fig. 1B is a cross sectional view of Fig. 1A;

[0016] Fig. 1C is a bottom plan view thereof;

[0017] Fig. 2A is a view showing the locked position of the valve mechanism according to this invention;

[0018] Fig. 2B is a view showing its unlocked position;

[0019] Fig. 3 is a cross sectional view showing another form of the suction connector in the valve mechanism according to this invention;

[0020] Fig. 4 is a cross sectional view showing still another form of the suction connector in the valve mechanism according to this invention; and

[0021] Fig. 5 is a cross sectional view showing still another form of the suction connector in the valve mechanism according to this invention.

[0022]         DETAILED DESCRIPTION OF THE INVENTION

[0023] The valve mechanism according to this invention is a valve mechanism attached to a tightly closed bag for holding its contents by keeping them from the ambient air and adapted to open for discharging air from the tightly closed bag and close for stopping such discharging, and comprising: a suction connector mounted on the outer side of a tightly closed bag having a hole formed therein, the suction connector having a vent formed in its center and being so shaped as not to form any projection on the outer side of the tightly closed

bag; a valve base mounted on the inner side of the tightly closed bag and having a recessed shape in cross section, a suction opening formed in its center as viewed in top plan and an edge portion joined to the suction connector with the tightly closed bag held therebetween; and a valve body facing the suction opening within the valve base and adapted to open the suction opening upon suction through the vent and close it upon stoppage of the suction.

[0024] The suction connector mounted on the outer side of a tightly closed bag having a hole formed therein is so shaped as not to have any portion projecting from the outer side of the tightly closed bag and has a vent formed in its center. The shape of the suction connector so shaped as not to have any projecting portion means, for example, a flat shape, or a shape which is arcuate in cross section to the extent not exceeding the thickness of its edge portion.

[0025] The shape of the suction connector so shaped as not to have any projecting means may also be a shape which is arcuate in cross section to the extent, for example, not exceeding the height of the recessed shape in cross section of the valve base when fitted therein as will be described later.

[0026] As it has hitherto been usual for a tightly closed bag to have a portion projecting from its outer side for connection with the nozzle of a suction device, it has been, for example, the case that the nozzle diameter does not suit it, or that its projecting portion damages any other, for example, tightly closed bag, but according to this invention, the suction connector so shaped as not to have any projecting portion can be used with any nozzle regardless of its diameter.

[0027] As there is no projection on the outer side of the tightly closed bag, the tightly closed bag in which the valve mechanism according to this invention is adopted can be stacked on, or placed adjacent to any other, for example, tightly closed bag without interfering with it, and therefore, without damaging it, while bags stacked, or placed adjacent to one another make a flat and stable form of packing.

[0028] The valve body attached on the inner side of a tightly closed bag has a recessed cross section, and preferably an arcuate cross section, so that when air is discharged from the tightly closed bag holding its contents, the valve body may not flaw its contents or leave any flaw thereon, even if it may be brought into close contact with them. Thus, the valve mechanism according to this invention can restrain its suction connector from projecting on the outer side of a tightly closed bag, as the valve body is situated in the valve base having a recessed cross section.

[0029] The valve mechanism according to this invention also has a ring member made of an elastic material and attached integrally to the valve base, for example, its edge portion, or for example, its outer peripheral surface having a recessed cross section, and the suction connector has a concavity formed in its portion corresponding in position to the ring member attached to the valve base. This ensures that when the valve mechanism is mounted in the hole formed in a tightly closed bag, the bag should be held between the ring member of an elastic material, such as rubber or a resin, and the concavity and thereby prevent any air from flowing in through between the suction connector and the valve base put together. The bag held between the ring member and the concavity is protected from breaking, as the ring member is of an elastic material.

[0030] The valve mechanism according to this invention also has a plurality of ridges formed on the opposite side of the valve base from the suction connector and extending from the periphery of a suction opening. This ensures that even when air is discharged from the tightly closed bag, the suction opening should not be closed by the contents of the bag, but enable air to be discharged satisfactorily.

[0031] The valve mechanism according to this invention also has load restraining means provided around the vent of the suction connector for restraining the load of the suction device used for discharging air from the tightly closed bag. The load restraining means may, for example, be formed by stepped portions keeping the nozzle of the suction device and the suction connector from making close contact with each other, or by holes extending through the suction connector. This ensures that even after discharging air from the tightly closed bag, the suction device should properly draw air from outside the tightly closed bag and thereby have its load restrained.

[0032] Description will now be made of embodiments of this invention with reference to the drawings. Figs. 1 and 2 show a valve mechanism embodying this invention. Figs. 3 to 5 show other forms of valve mechanisms embodying this invention. The valve mechanism 1 according to this invention is mounted in a hole made in a tightly closed bag, not shown, for holding its contents by keeping them from the ambient air, and the embodiment shown in Figs. 1 and 2 is constructed as described below.

[0033] The valve mechanism 1 has a circular suction connector 2 attached to the outer side of the hole of the tightly closed bag, as will be described below. The suction connector 2 is

circular in order not to damage the tightly closed bag. The suction connector 2 has an arcuate cross section protruding outwardly from the outer side of the tightly closed bag to the extent not exceeding the thickness of the edge portion of the suction connector 2 according to the embodiment under description, and has a hole formed in its center as viewed in top plan, and defining a vent 2a. The suction connector 2 has a concavity 2b formed in its position facing the edge portion of a valve base 3 as will hereinafter be described.

[0034] Moreover, the suction connector 2 has a groove 2c formed diametrically outwardly from the vent 2a. A lock member 2A is installed in the groove 2c slidably along it. The lock member 2A has an operating portion 2d exposed on the outside of the tightly closed bag from the groove 2c and a leg portion 2e formed integrally with it and protruding toward the inside of the tightly closed bag.

[0035] The suction connector 2 according to the embodiment under description has stepped portions formed in its surface on the outer side of the tightly closed bag and defining load restraining means 2B. The load restraining means 2B keep the nozzle of a suction device from making intimate contact with the upper surface of the suction connector 2, so that the nozzle may properly draw air from outside of the tightly closed bag, while drawing air from its inside, whereby it is possible to restrain any large load from acting suddenly upon the suction device after air has been discharged from the tightly closed bag.

[0036] The valve mechanism 1 has a circular valve base 3 mounted on the inner side of the hole of the tightly closed bag as will hereinafter be described. The valve base 3 has a recessed



cross section, or a trapezoidal cross section according to the embodiment under description, defines a flow space 3a in its inside and has a suction opening 3b formed in its center as viewed in top plan. Moreover, the valve base 3 has a ring member 3c of an elastic material, such as a resin, attached to its edge portion integrally therewith. The ring member 3c fits in the concavity 2b of the suction connector 2 by elastic deformation, while holding the edge portion of the hole of the tightly closed bag therebetween.

[0037] Moreover, the valve base 3 has 12 radial ridges 3d formed on its surface opposite the surface in which it is joined to the suction connector 2, or on its surface facing the inside of the tightly closed bag, and extending from the suction opening 3b. The ridges 3d are formed to ensure the passage of air to the suction opening 3b, and do not necessarily have to extend from the edge of the suction opening, nor is their number limited if it is plural.

[0038] The ridges 3d are curved in corner so as not to damage the contents when contacting them. The suction connector 2 and the valve base 3 are joined together by the ring member 3c fitted in the concavity 2b with the edge portion of the hole on the inner side of the tightly closed bag held therebetween, as stated above, whereby the valve mechanism 1 is attached to the tightly closed bag.

[0039] The valve mechanism 1 also has a valve body 4 adapted to open and close the suction opening 3b of the valve base 3. The valve body 4 is, for example, hinged at one end to open and close at another end opposite diametrically of the suction opening 3b. The valve member 4 has a seal member 4a of a resin on its rear surface.

[0040] The valve mechanism 1 having the construction described above first has its suction connector 2 positioned outside a tightly closed bag and its valve base 3 positioned inside it, so that the concavity 2b of the suction connector 2 and the ring member 3c of the valve base 3 may face each other along the edge portion of the hole in the tightly closed bag, and the ring member 3c is fitted in the concavity 2b with the edge portion of the hole of the bag held therebetween. The edge portion of the hole of the tightly closed bag held between the concavity 2b and the ring member 3c is not damaged as the ring member 3c is of an elastic material, and the suction connector 2 and the valve base 3 are joined firmly and held against movement.

[0041] After its contents are put in the tightly closed bag and its opening is closed, the lock member 2A is caused to slide along the groove 2c as shown from Fig. 2A to Fig. 2B. As a result, the valve body 4 has its upper surface released from the pressure of the leg portion 2e so as to open at the other end.

[0042] Then, a suction device has its nozzle placed on the upper surface of the suction connector 2 so as to cover its vent 2a and its suction is started. As its suction is started and proceeds, the valve body 4 is rotated at one end to swing at the other end and open the suction opening 3b.

[0043] Air is discharged from the tightly closed bag through the suction opening 3b, flow space 3a and vent 2a. Although a gradual reduction in volume of the tightly closed bag may cause its contents to approach the suction opening 3b closely, the ridges 3d keep the suction opening 3b from being blocked by its contents.

[0044] Although the discontinuation of the suction may result in the close contact of the valve base 3 with the contents of the bag, and although the load of an upper bag in a stack may cause the close contact of the valve base 3 in a lower bag with its contents, the ridges 3d rounded in corner according to the embodiment under description do not damage the contents of the bag.

[0045] If the operating portion 2d of the lock member 2A is moved back along the groove 2c to the center of the suction connector 2 by the nozzle of the suction device upon discontinuation of its suction, the valve body 4 is locked by the leg portion 2e. The lock member 2A and the groove 2c are, however, not always the essential features, since the valve body 4 is drawn inwardly by the negative pressure prevailing in the tightly closed bag.

[0046] When a plurality of tightly closed bags are stacked or placed adjacent to one another after they are supplied with their contents and compressed, the valve mechanism 1 according to this invention having its suction connector 2 formed in a flat shape does not make any projection on the outer side of any tightly closed bag, but allows the bags to form a flat and stable shape of packing.

[0047] Description will now be made of the valve mechanism 1 shown in Fig. 3. According to the embodiment shown in Fig. 3, a suction connector 2 has an arcuate cross section protruding greatly beyond the thickness of its edge portion from the outer side of a tightly closed bag. The suction connector 2 is confined in the recessed cross section of a valve base 3 so that its arcuate cross sectional portion may not protrude beyond the height of the recessed cross section of the valve base. Thus, the structure shown in Fig. 3 is also so formed that the

suction connector 2 may have the shape not forming any projection on the outer side of a tightly closed bag.

[0048] According to the embodiment shown in Fig. 3, load restraining means 2B are formed by holes extending through the suction connector 2. The load restraining means 2B are formed along the outer circumference of the suction connector 2 as far as possible, so as not to be traversed by the diameter of the nozzle of the suction device.

[0049] The valve base 3 has a horizontal step formed at a specific level of height on the side wall of its recessed cross section, and carrying a ring member 3c. The ring member 3c is fitted in the concavity 2b of the suction connector 2 to join the suction connector 2 and the valve base 3 together.

[0050] The embodiment shown in Fig. 4 is differentiated from the structure shown in Fig. 3 by a suction connector 2 having an edge portion equal in height to that of a valve base 3, and by the suction connector 2 having an outline so shaped as to fit the outline of the edge portion of the valve base 3 without allowing any clearance therebetween except for the wall thickness of a tightly closed bag. Thus, the structure shown in Fig. 4 is also so formed that the suction connector 2 may have the shape not forming any projection on the outer side of a tightly closed bag.

[0051] According to Fig. 4, the suction connector 2 has a central portion somewhat recessed below its edge portion to position the nozzle of a suction device. Moreover, the recessed

central portion of the suction connector 2 has load restraining means 2B formed along its outer circumference.

[0052] The embodiment shown in Fig. 5 is differentiated from the structure shown in Fig. 3 by a suction connector 2 having an arcuate cross section protruding greatly beyond the thickness of its edge portion toward the inside of a tightly closed bag. Thus, the structure shown in Fig. 5 is also so formed that the suction connector 2 may have the shape not forming any projection on the outer side of a tightly closed bag.

[0053] While specific shapes have been shown by the embodiments shown in Figs. 3 to 5 for “the shape” of the suction connector 2 “not forming any projection on the outer side of a tightly closed bag”, they are not limiting if it is so shaped as not to interfere with any other, for example, tightly closed bag stacked on, or placed adjacent to one tightly closed bag, or damage it, while allowing bags stacked on, or placed adjacent to one another to form a flat and stable shape of packing.

[0054] As described above, the valve mechanism according to this invention has a suction connector mounted on the outer side of a tightly closed bag having a hole formed therein, the suction connector having a vent formed in its center and being so shaped as not to form any projection on the outer side of the tightly closed bag, and a valve base mounted on the inner side of the tightly closed bag and having a recessed shape in cross section, the valve mechanism according to this invention can be used with any nozzle regardless of its diameter, and a tightly closed bag in which the valve mechanism according to this invention is adopted can be stacked on, or placed adjacent to any other, for example, tightly closed bag without

interfering with it, and therefore without damaging it, while bags stacked on or adjacent to one another can form a flat and stable shape of packing.

[0055] The valve mechanism according to this invention also has a ring member made of an elastic material and attached integrally to the valve base and the suction connector has a concavity formed in its portion corresponding in position to the ring member attached to the valve base, so that when the valve mechanism is mounted in the hole formed in a tightly closed bag, the bag maybe held between the ring member and the concavity and thereby prevent any air from flowing in through between the suction connector and the valve base put together. The bag held between the ring member and the concavity is protected from breaking, as the ring member is of an elastic material.

[0056] The valve mechanism according to this invention also has ridges formed on the opposite side of the valve base from the suction connector and extending from the periphery of a suction opening, so that even when air is discharged from the tightly closed bag, the suction opening may not be closed by the contents of the bag, but may enable air to be discharged satisfactorily.

[0057] The valve mechanism according to this invention also has load restraining means provided around the vent of the suction connector for restraining the load of the suction device used for discharging air from the tightly closed bag, so that even after discharging air from the tightly closed bag, the suction device may properly draw air from outside the tightly closed bag and thereby have its load restrained.